Regional Mercury Regression Model

EPA Regional Lab

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Project Participants and Collaborating Agencies

- NEIWPCC (water), NESCAUM (air), and NEWMOA (waste)
- New England States
- EPA Regional Mercury Workgroup
- EPA Headquarters
- Mercury Consortium (a.k.a.Northeast Mercury Research Group)
- NEG/ECP Regional Mercury Task Force
- USGS (Pembroke, NH, and Reston, VA, offices)

Project Objectives

- Develop regional GIS-based models
  - Information about Hg sources
  - Id factors (natural and human) correlated with elevated fish levels
  - Id vulnerable watersheds
  - Evaluate management options
  - Optimize future data collection

Project Components

- “National Model” – EPA Office of Water
  - Hg Maps showing watersheds where fish-tissue levels > fish-tissue criterion
- “Regional Model” – EPA Region 1, USGS (NH office), NEIWPCC
  - GIS-based regression model

Regional Model

- $Y = aX_1 + bX_2 + cX_3 \ldots,$

  where Y = Hg levels in fish tissue,

  X_1, X_2, …= factors potentially correlated with Y,

  a, b, c,.. = coefficient associated with X (degree of correlation with Y)

Regional Model

- Not SPARROW model – it will not model Hg transport in water
- It is a risk model
  - For identifying factors contributing to high levels of Hg in fish
  - For predicting susceptibility of Hg contamination in fish

Regional Model – first phase

Compile data for model both for Y (response) variable (Hg in fish tissue) and X (explanatory) variables

Data for Y variable

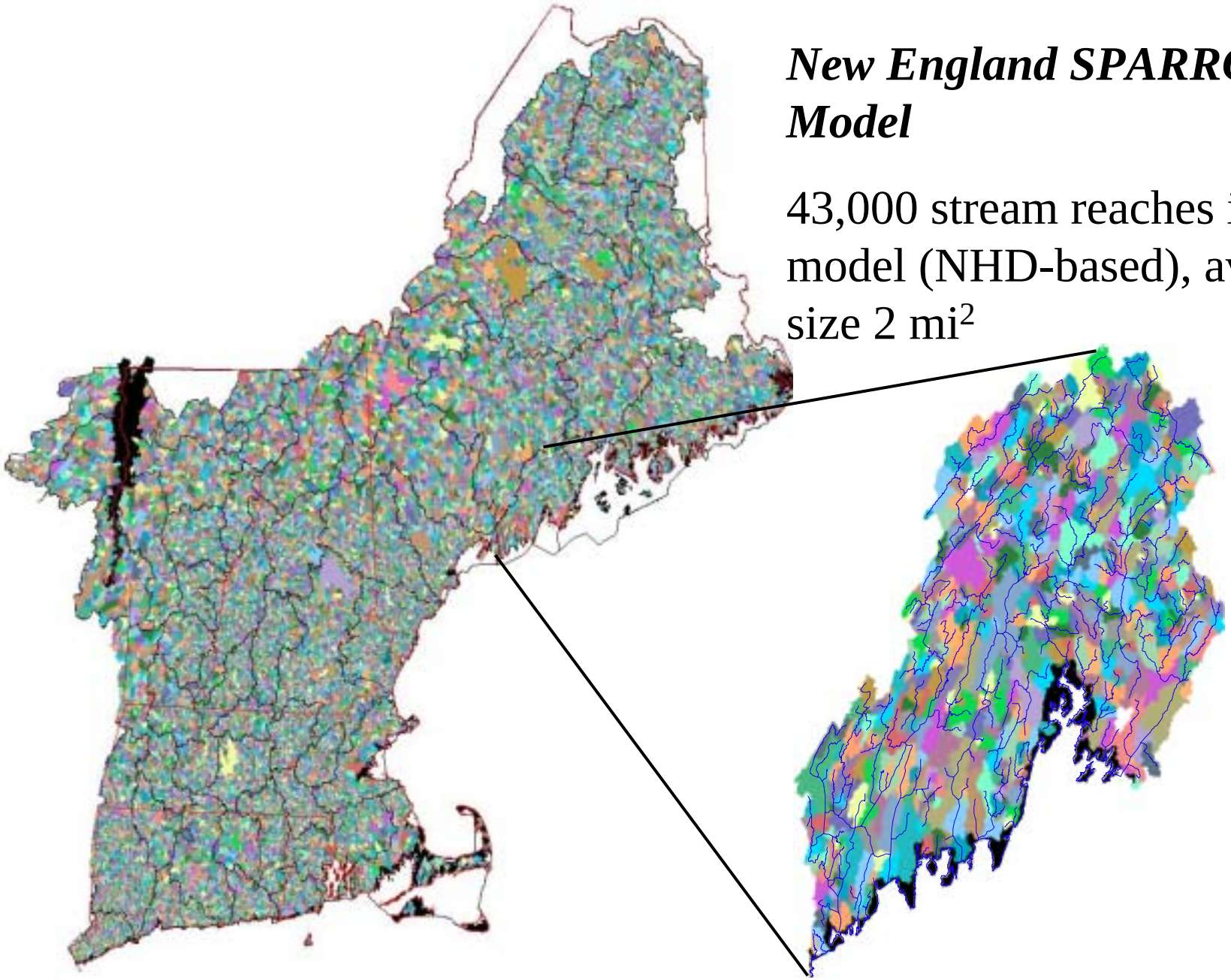
- **Hg data for fish tissue**:
  - NERC Mercury Research Group data
  - EPA National Survey of Mercury Concentrations in Fish (1990-1995)
  - State databases/files
  - US Fish and Wildlife data
  - USGS NAWQA data
  - Other studies
  - Ancillary data (sampling locations & dates, fish species, size, age, waterbody type)

Data for X variables

- **Point sources** (location, Hg-release amounts) – EPA, NESCAUM
- **Hg atm-dep patterns** - National Atmospheric Deposition Program Network, EPA and other modeling
- **Water-quality** (e.g., water pH, color, alkalinity, lake trophic status, etc.)
- **Watershed features** - SPARROW (e.g., land use, pop, wetlands, soils, stream networks, streamflow, watershed boundaries, etc.)

Regional Model - Second Phase

- Build regression models (and link with Hg Maps)
  - determine spatial extent of tissue data
  - determine fish species with adequate data
  - develop initial model(s). Goal: Produce exploratory model (NH/VT) in 2004 – use to id strongest variables to help focus data efforts



New England SPARROW Model

43,000 stream reaches in the model (NHD-based), average size 2 mi^2

Project Benefits

- Expand/compile scientific info on Hg sources, environmental impacts at regional level
- Focus on primary pathway of human exposure – fish tissue
- Scientific tool for linking sources and impacts on waterbodies
- Serve as tool for understanding factors contributing to high Hg levels in fish tissue

Project Benefits

- Provides scientific support for additional reductions in emission/loading rates
- Potential for identifying indicators for testing reduction strategies and measuring environmental results (i.e., expected Hg reductions in fish tissue)
- Tool for identifying data gaps and for sample design
- Tool for targeting collection of fish tissue to vulnerable waterbodies

Goals of today's meeting

- Definition of roles/responsibilities of participants
- Status of work completed to date
- Task list and prioritization of tasks
- Rough timeline
  - Timeline 1: low funding/resources
  - Timeline 2: higher funding/resources